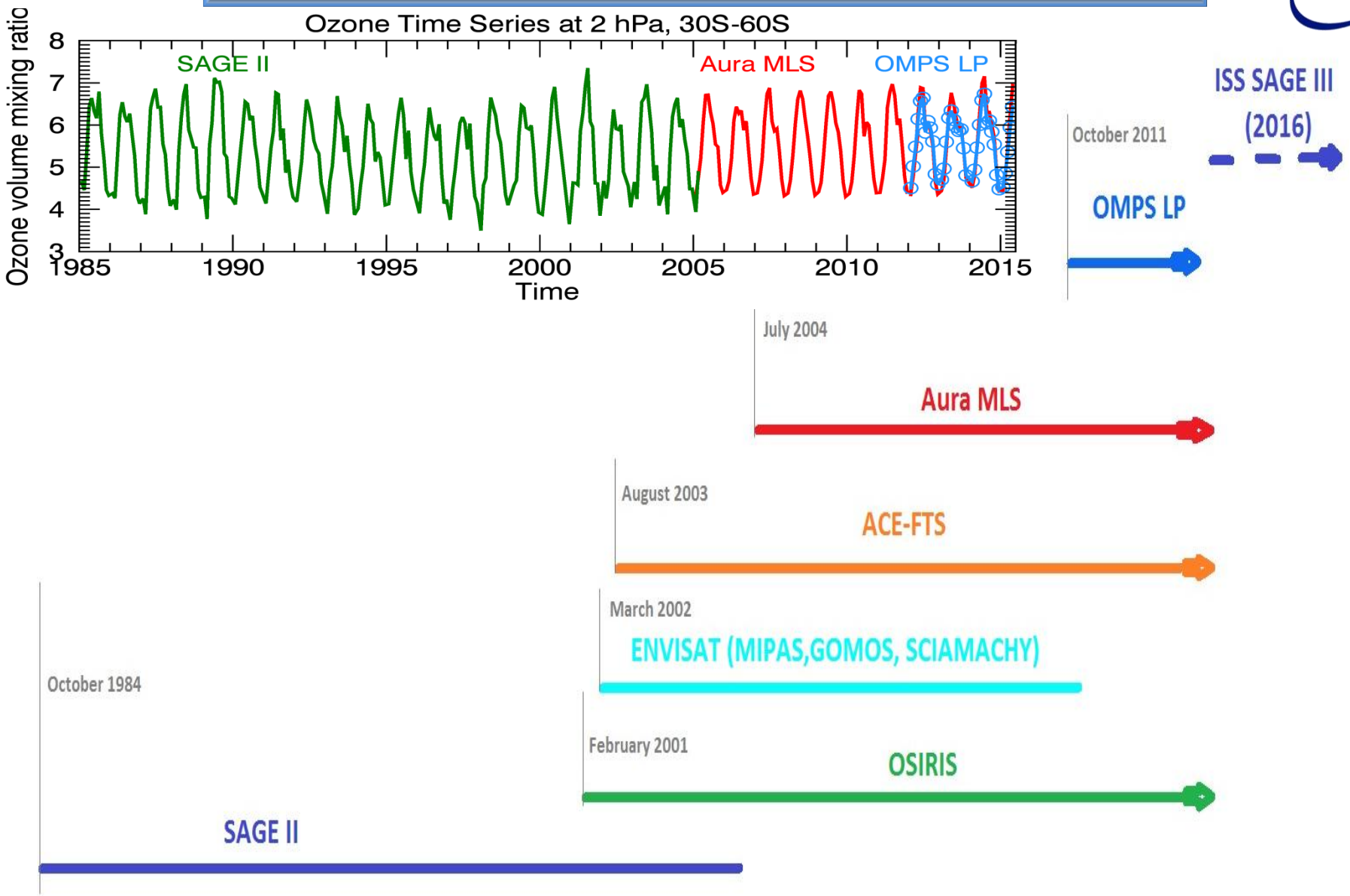
Assessment of OMPS Limb Profiler version 2.0 ozone retrievals: continuation of SAGE and MLS High-Resolution Ozone Profiles with the OMPS LP

Natalya A. Kramarova, P.K. Bhartia, Leslie Moy, Zhong Chen and Stacey Frith

OMPS Science Team Meeting, December 3, 2015

OMPS Limb Profiler



OMPS Limb Profiler

Long-term Ozone Profile Record (SAGE+OSIRIS+OMPS LP) or (SAGEII+MLS+OMPS LP)

STEP I. Test of LP suitability to continue the ozone climate record:

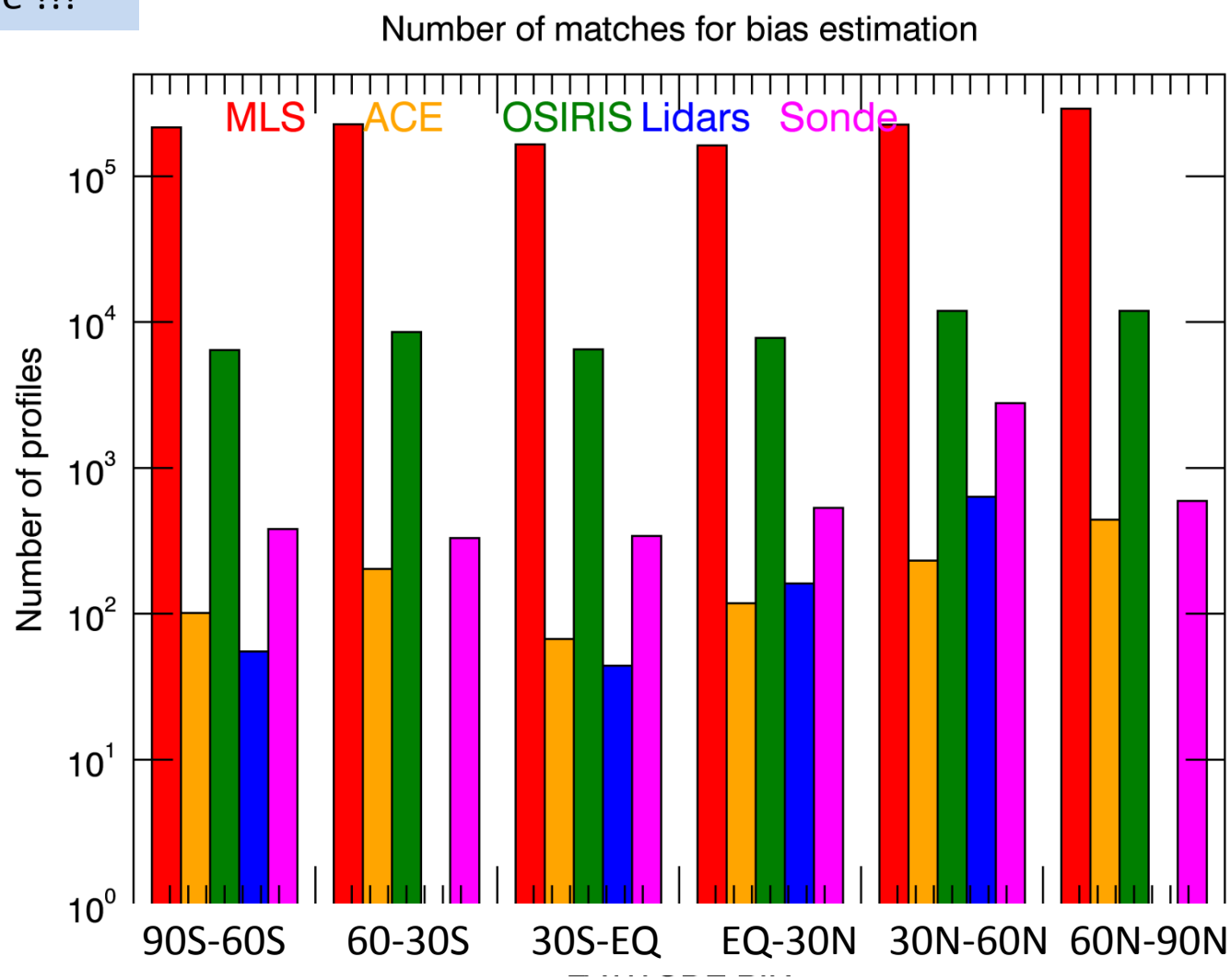
- **TH registration** is the main source of uncertainties in limb measurements: reliable methods for TH registration; analysis/sensetivity to error sources (GPH, aerosol, ozone climatology etc.); methods to validate TH registration.
- **Validation of ozone retrievals**: biases; drifts; short-term and long-term ozone variability (profile-to-profile variability, seasonal cycle, QBO, Antarctic ozone hole etc.)

STEP II. Merging technique.

- Bias-correction methods; merging anomalies vs raw data; use assimilated ozone fields for spatial interpolation;
- Estimate errors associated with the merging technique.

Validation of OMPS LP v2 retrievals

Log scale !!!



MLS:
Jan 2012-Nov 2015;

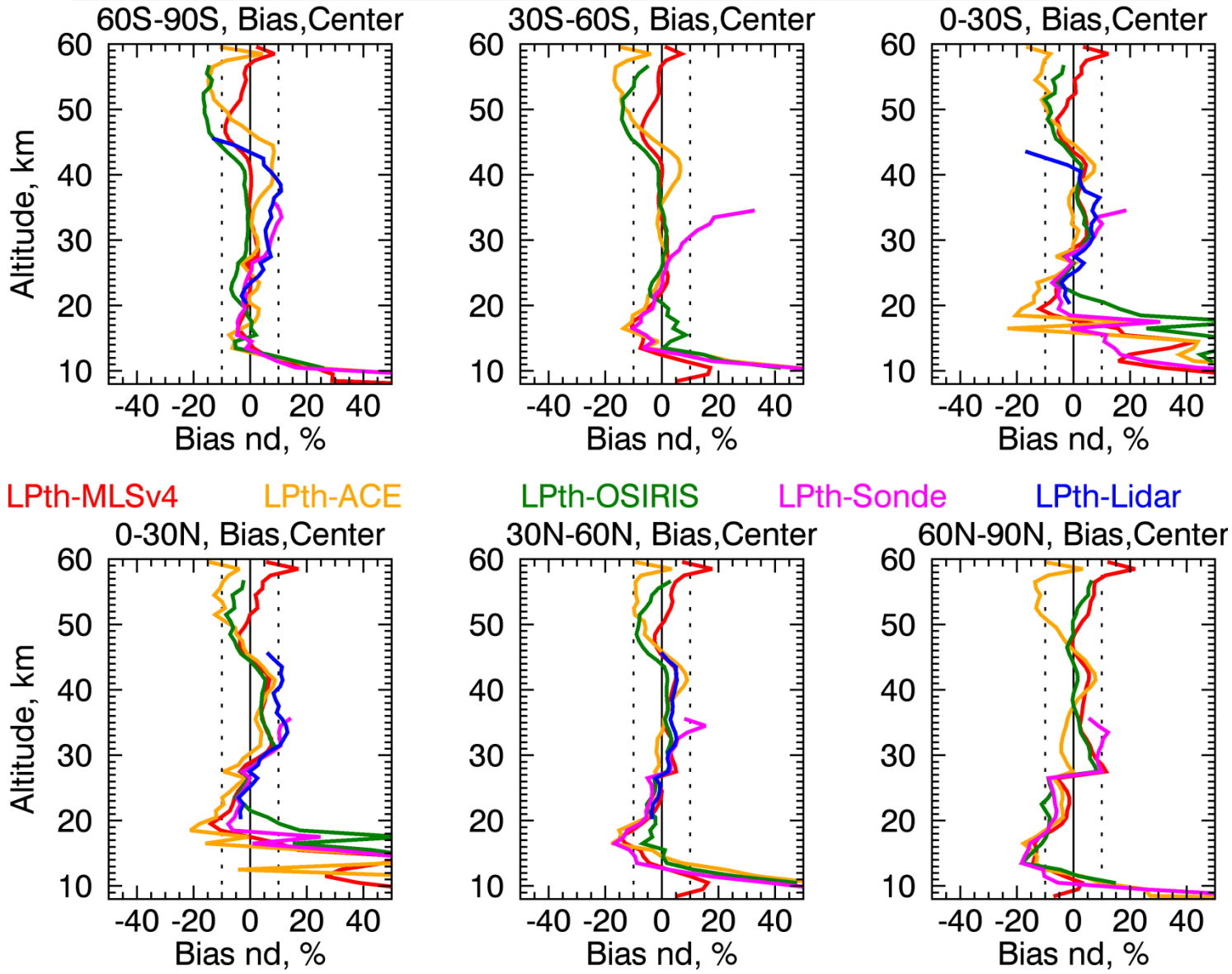
Osiris:
Jan 2012-Dec 2014;

ACE FTS:
Apr 2012-Apr 2013;

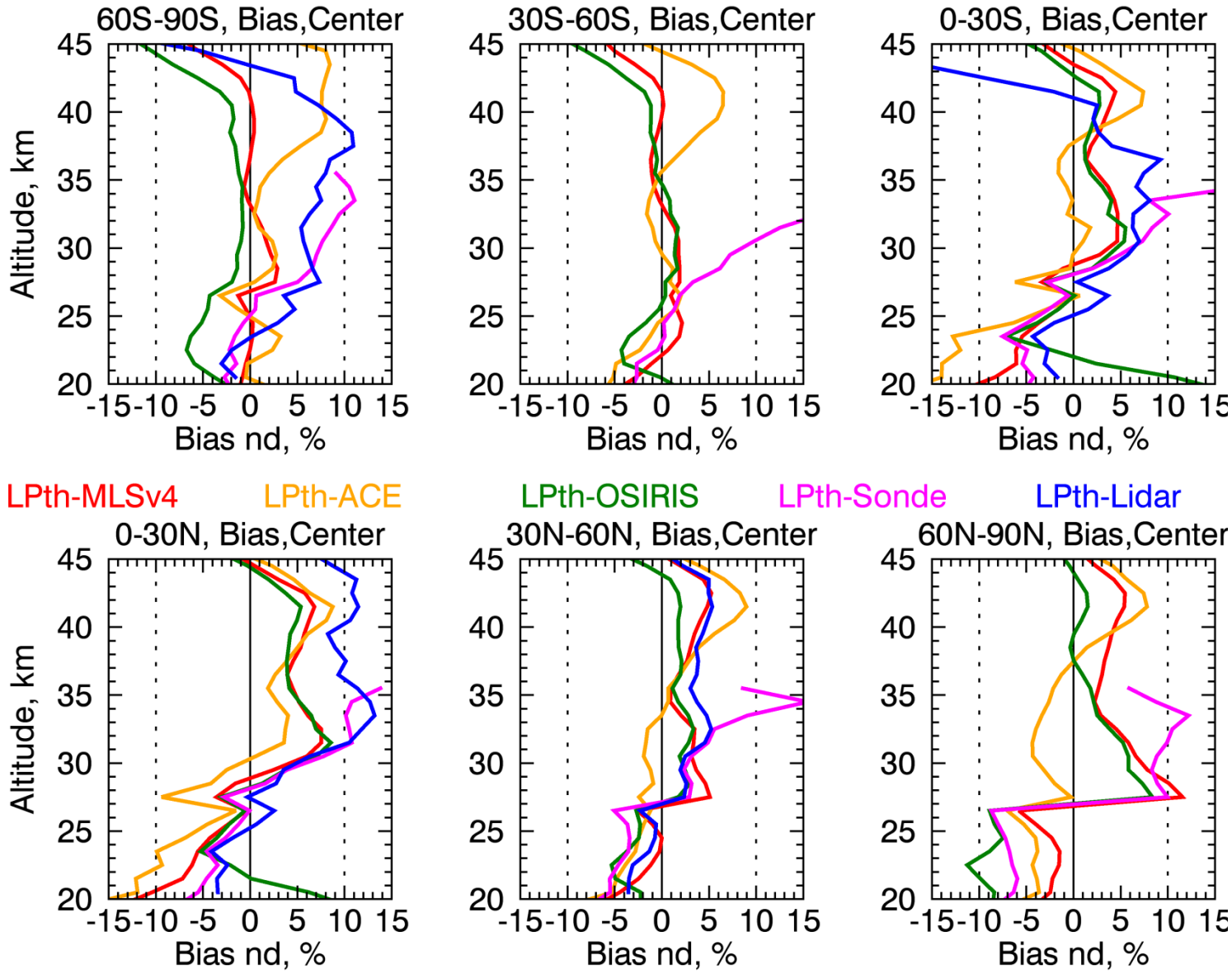
Lidars: 6 stations;

Sondes: 44 stations

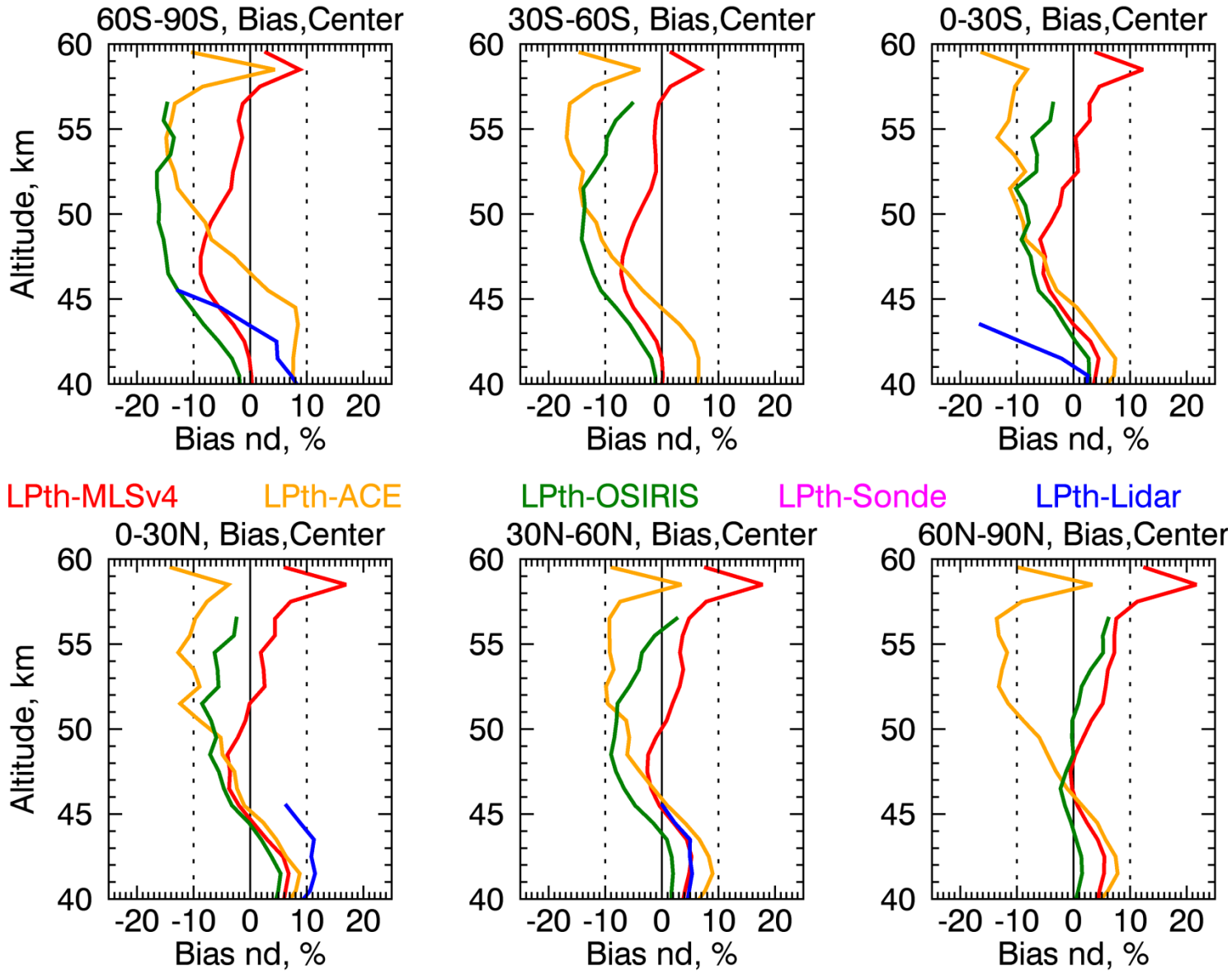
Biases, 8-60 km



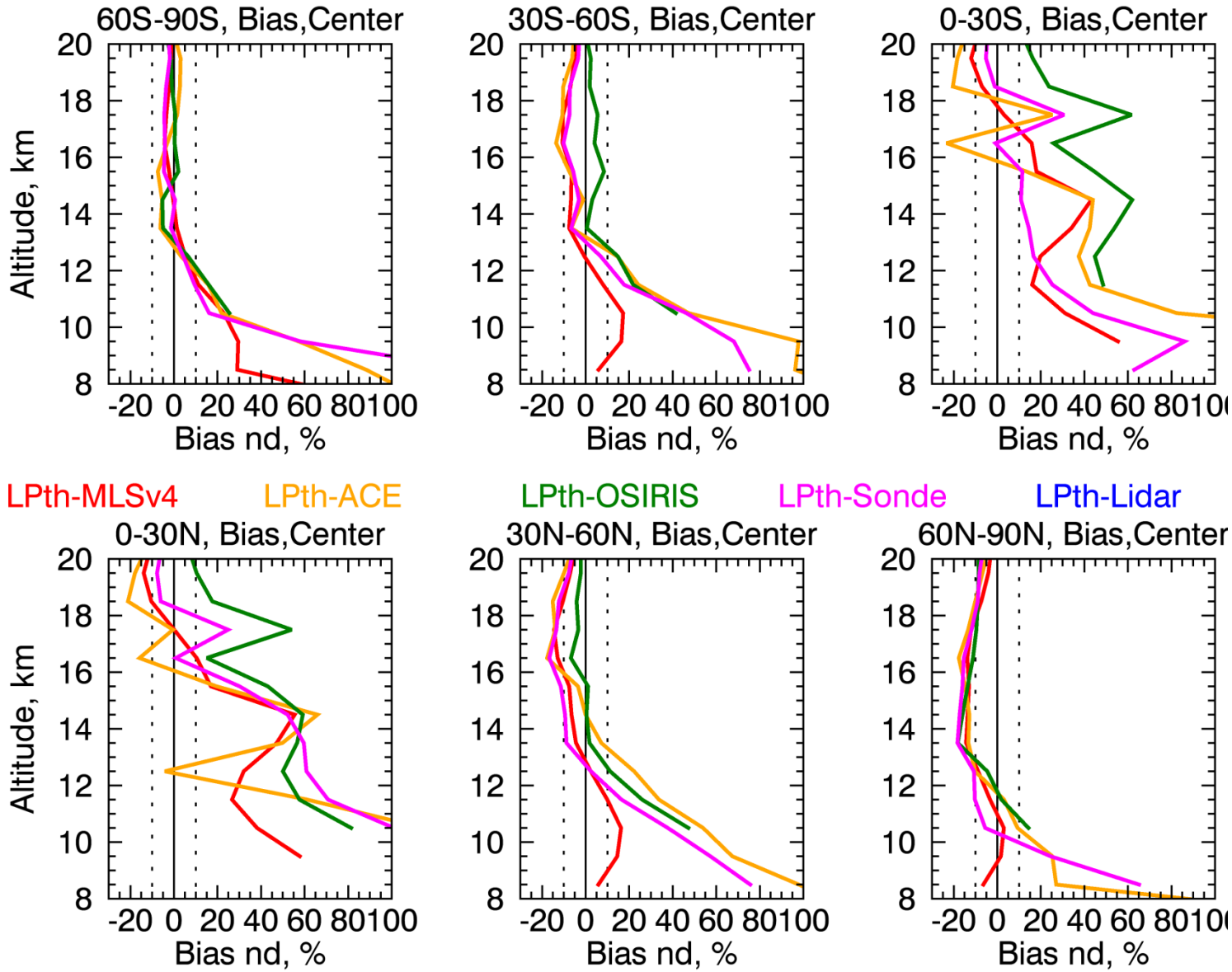
Biases 20-45 km



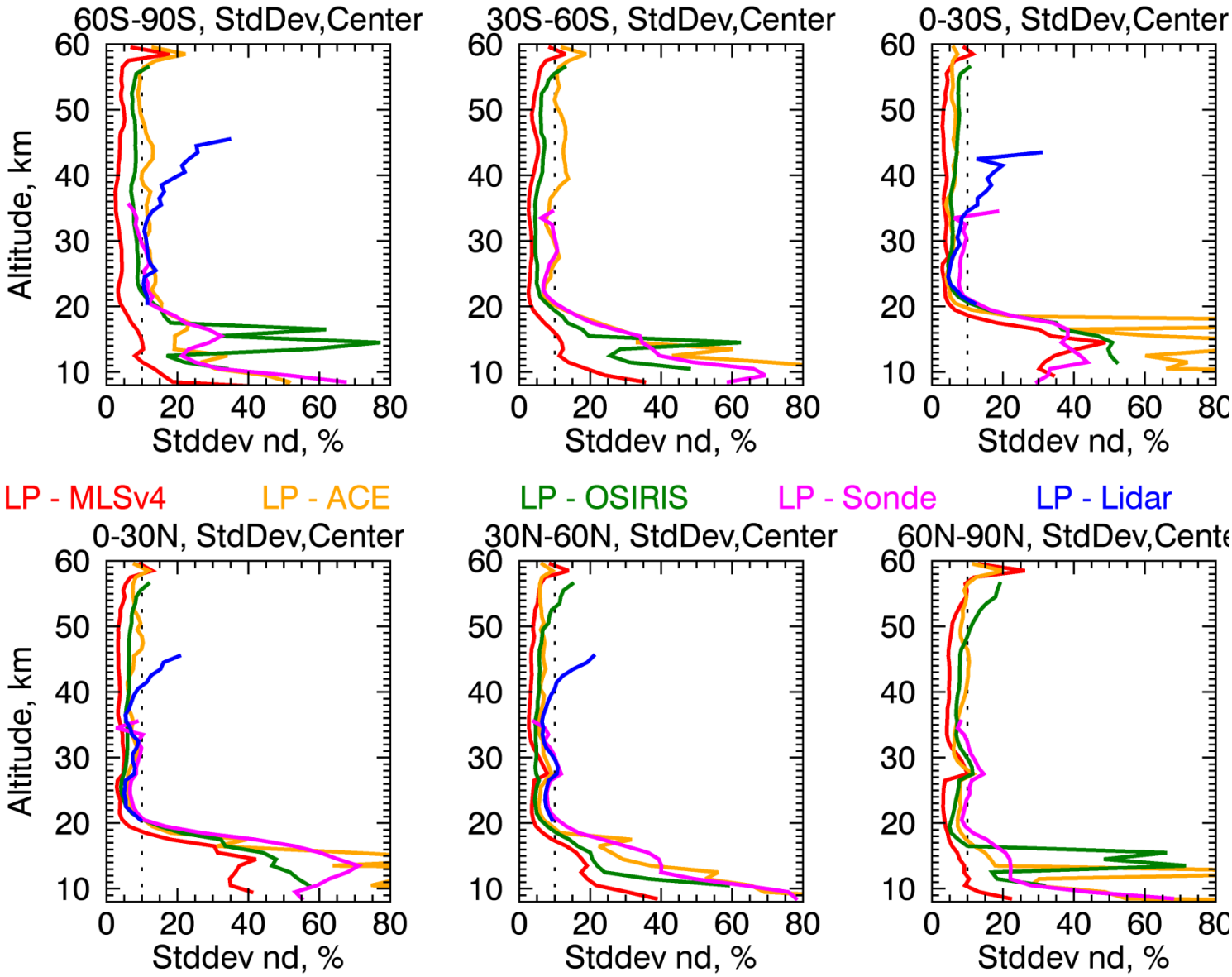
Biases, 40-60 km



Biases 8-20 km

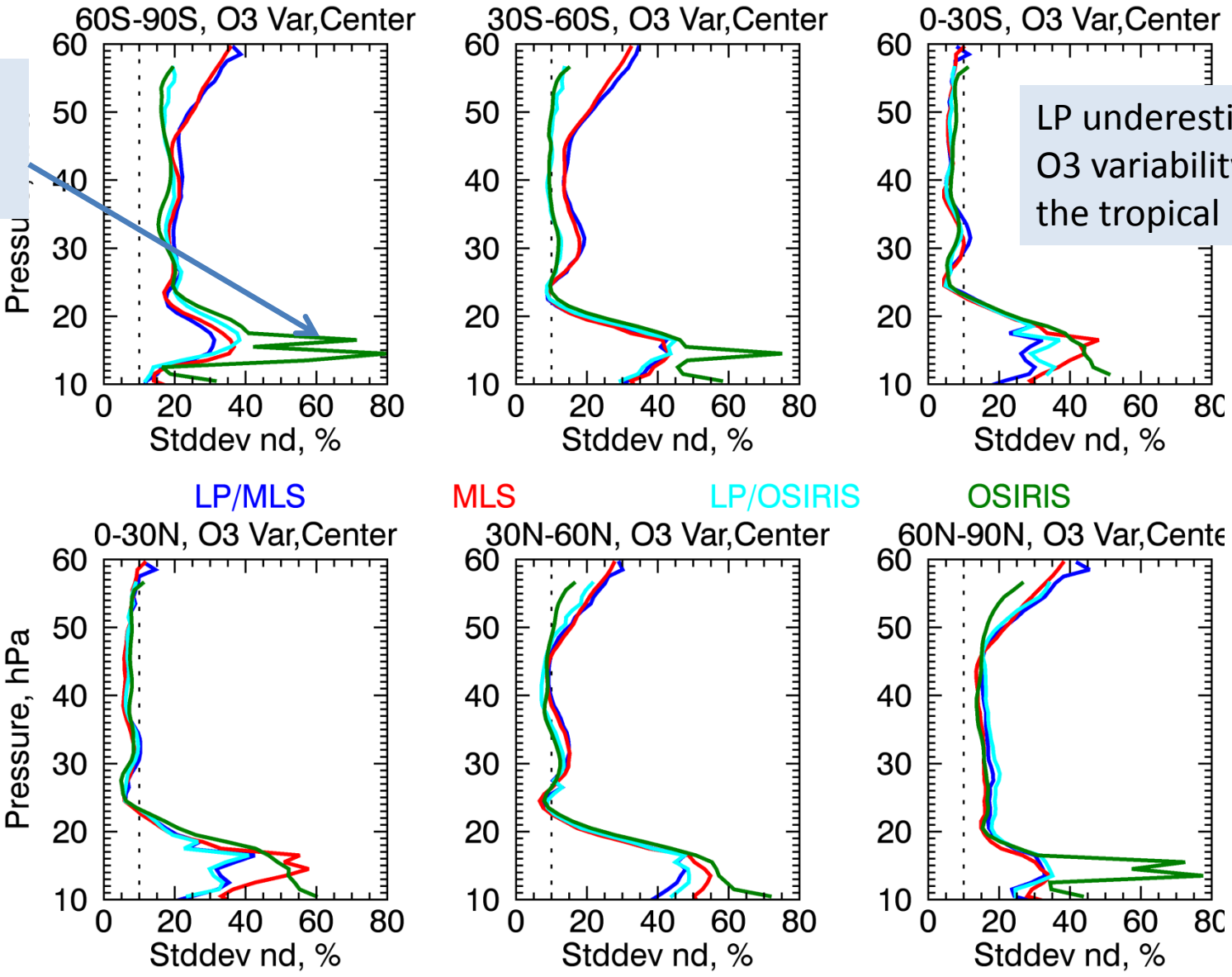


Std Dev for differences



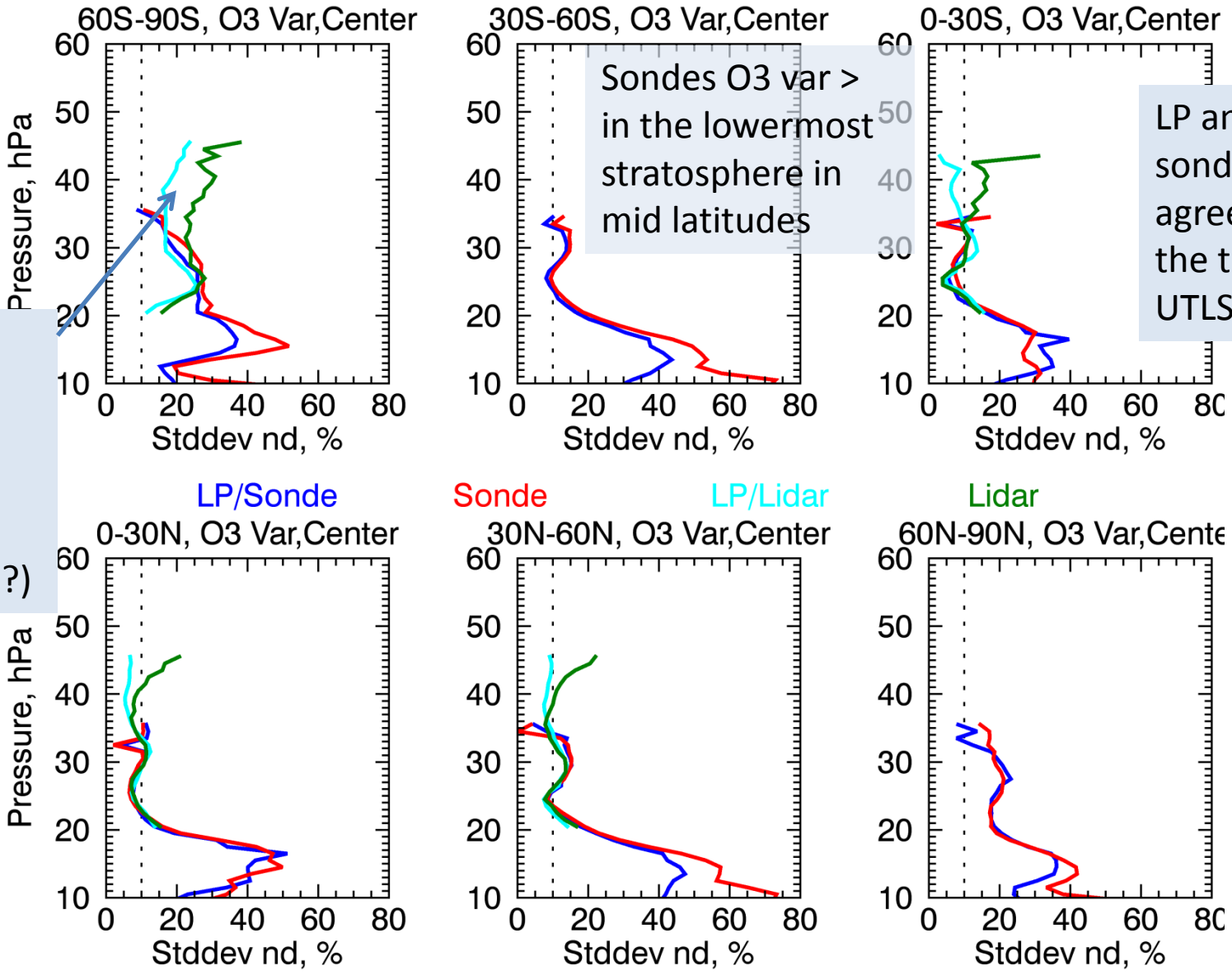
Ozone variability, satellites

OSIRIS data should be screened



LP underestimates O3 variability in the tropical UTLS

Ozone variability, ground-based



Sondes O3 var > in the lowermost stratosphere in mid latitudes

LP and sondes agree well in the tropical UTLS !!!

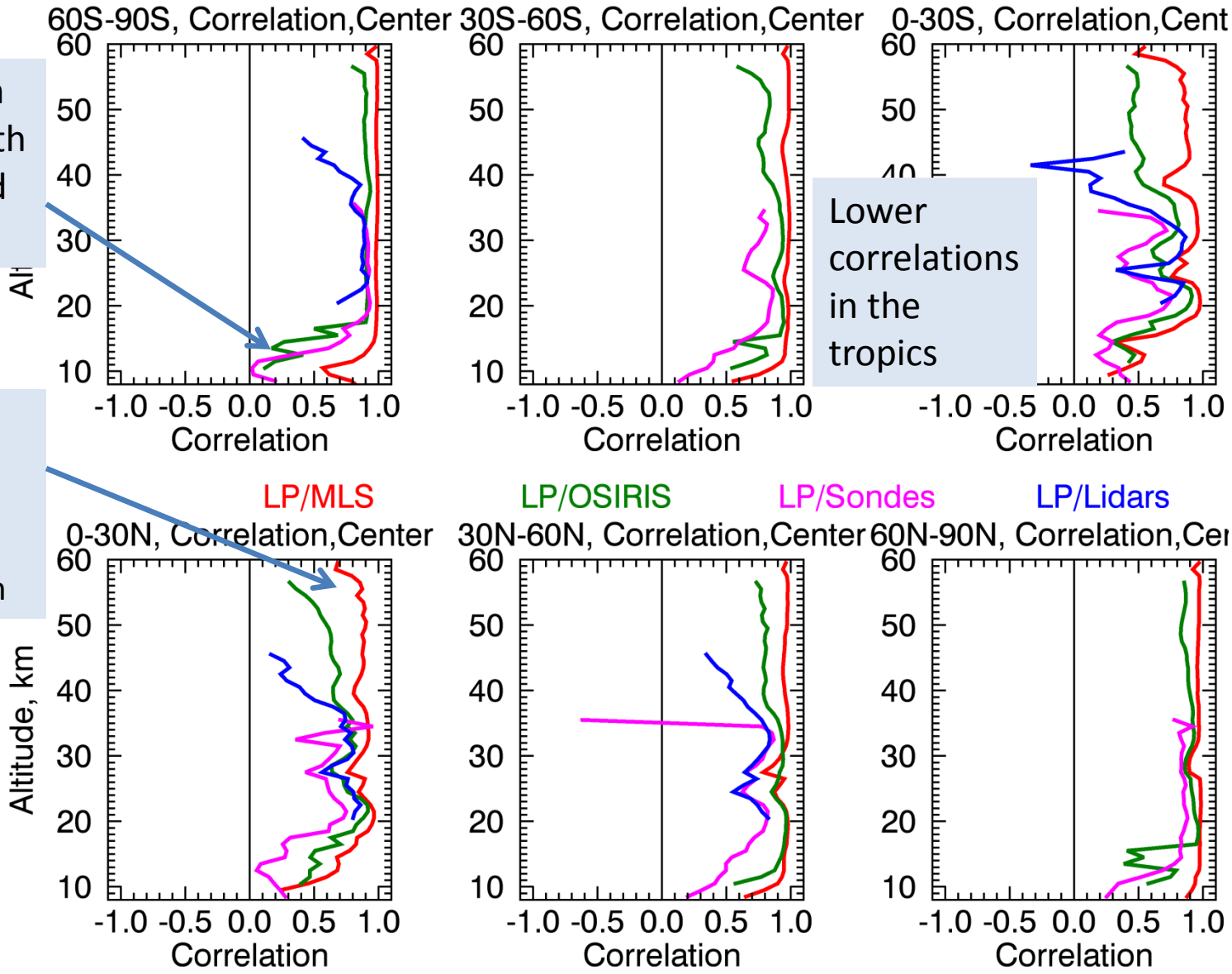
Lidar measures more variability than LP (better VR ??)

Ozone correlation

Correlation is purer with sondes and lidars

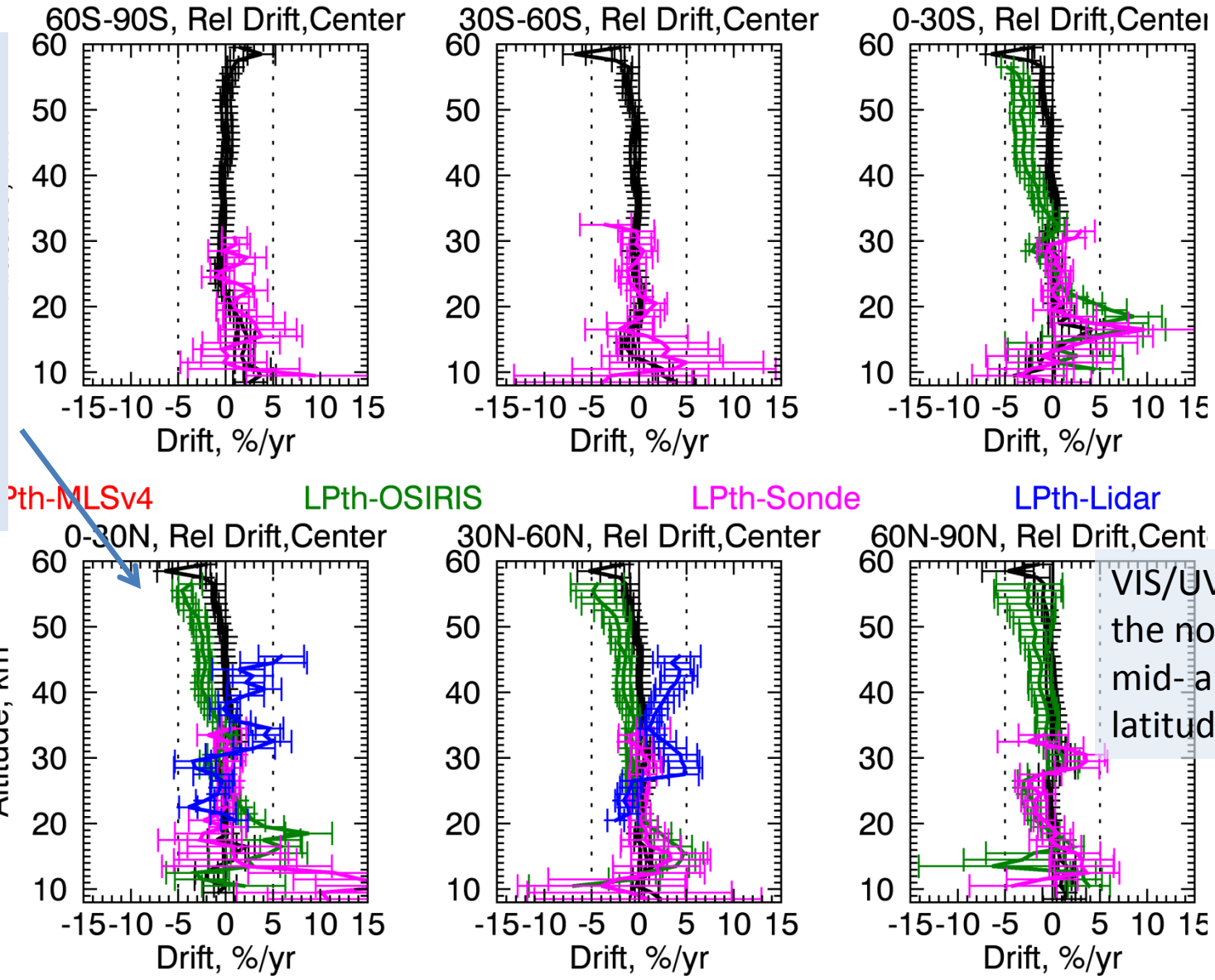
Drop in correlation with MLS in the tropics above 55 km

Lower correlations in the tropics



Relative drift, % per yr

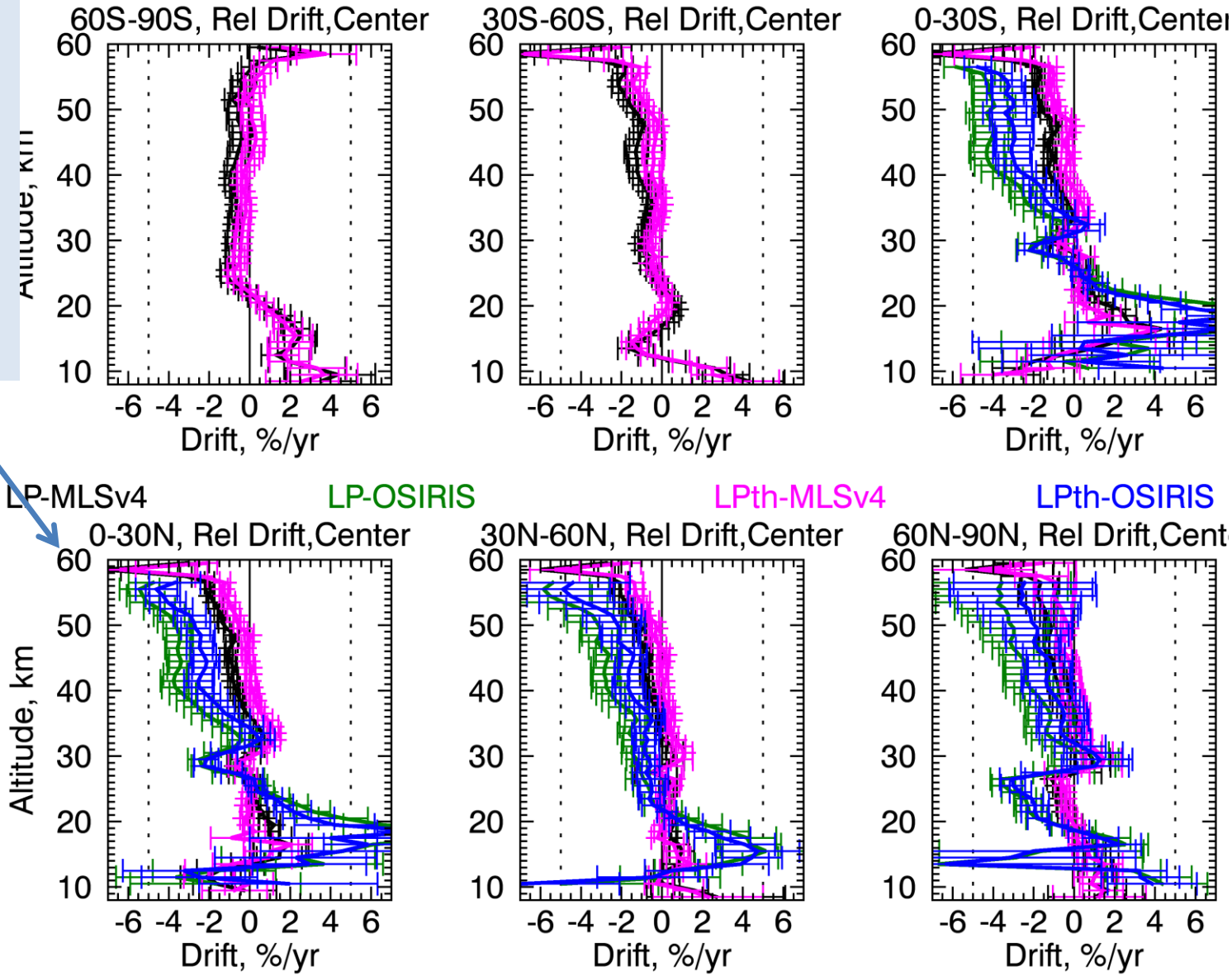
LP has negative drifts relative to OSIRIS and MLS above 40 km (more negative relative to OSIRIS)



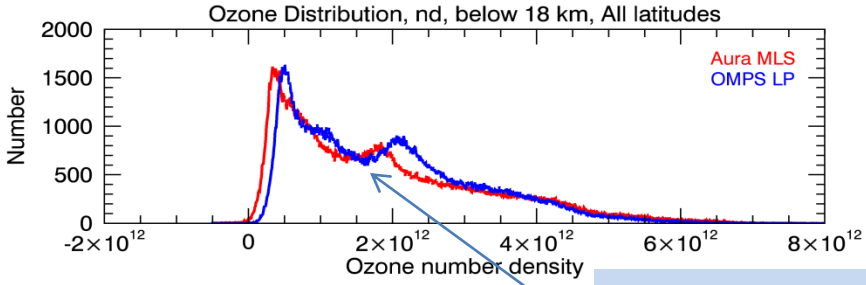
VIS/UV drift in the northern mid- and high latitudes

Relative drift (%/yr) before and after 100m adjustment

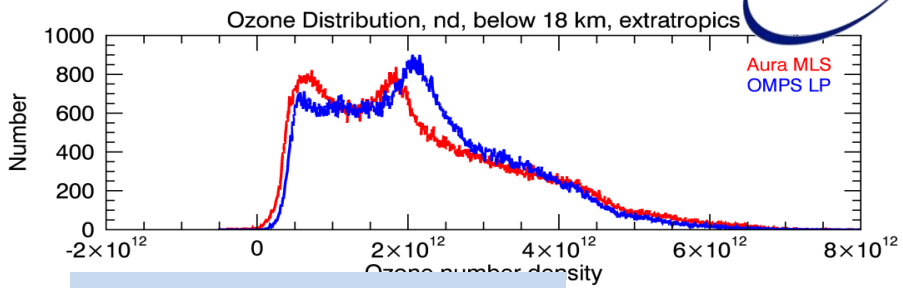
The 100m adjustment significantly reduces drifts relative to OSIRIS and MLS



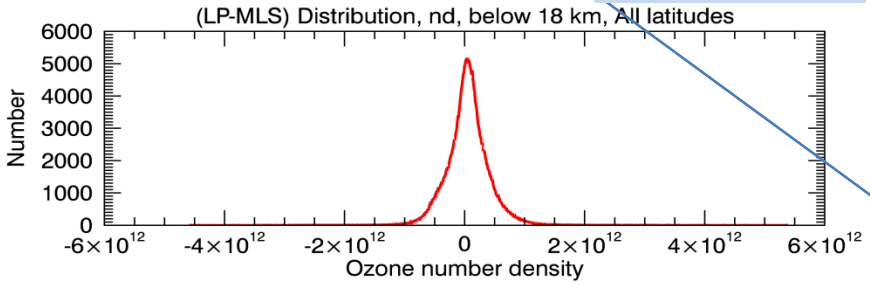
Ozone distribution in UTLS (8-18 km), LP and MLS

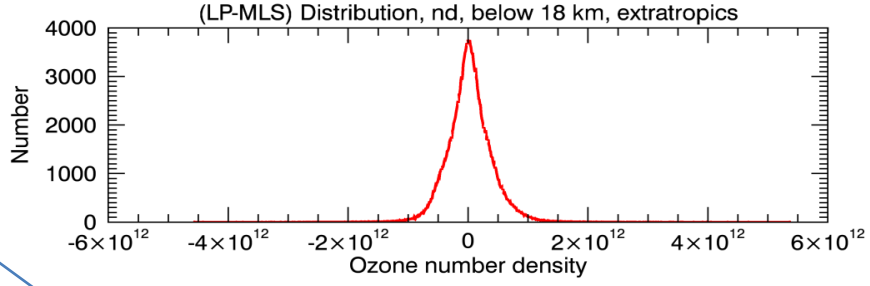


All latitudes

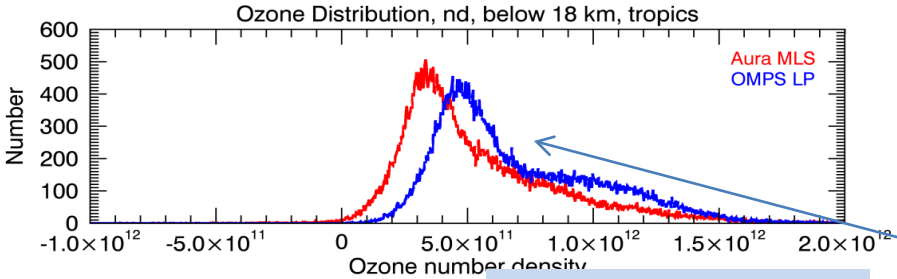


Extraropics (90-20S/N)

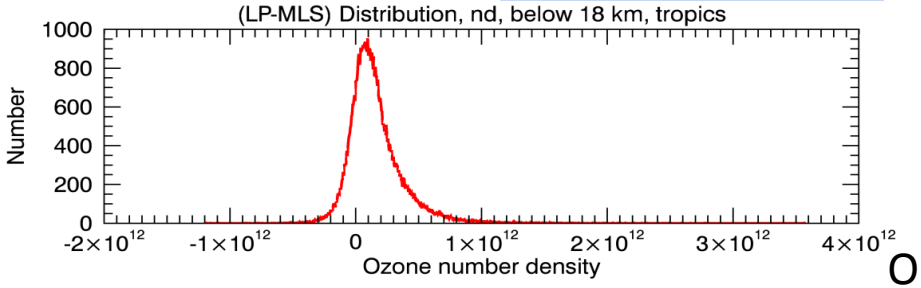




Below 18 km PDF is bimodal

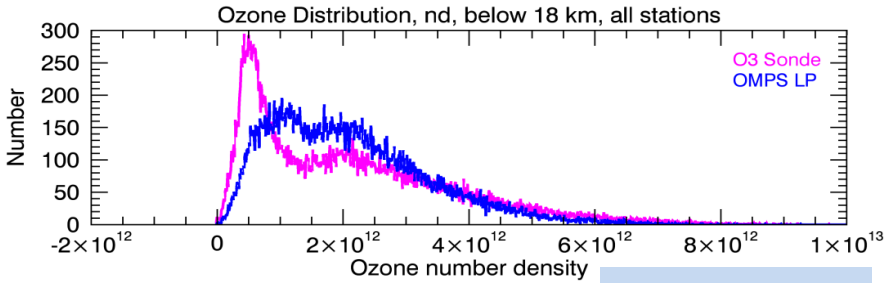


Tropics 20S-20N

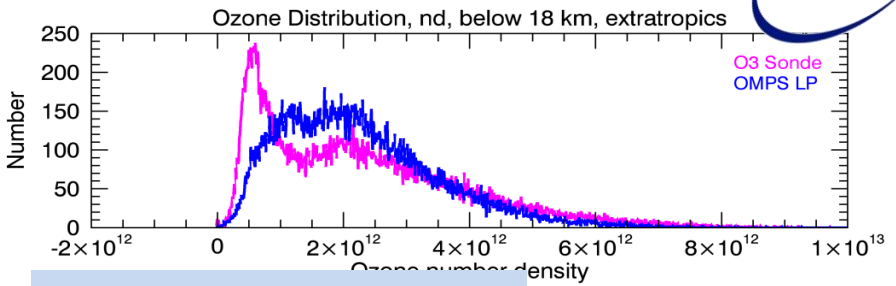


LP distribution in the tropics is shifted relative to MLS

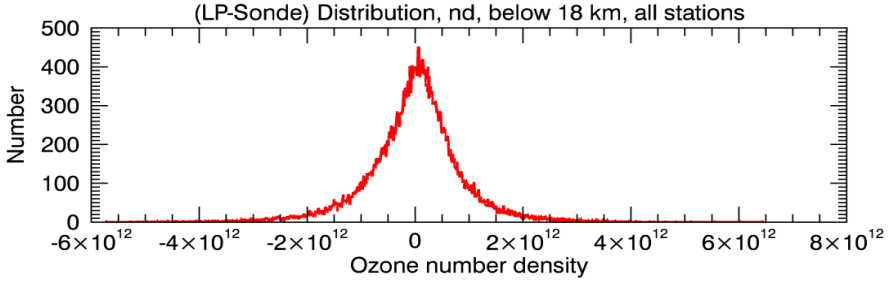
Ozone distribution in UTLS (8-18 km), LP and sondes

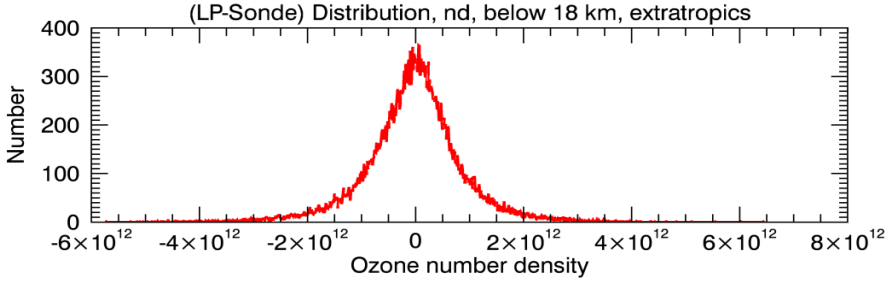


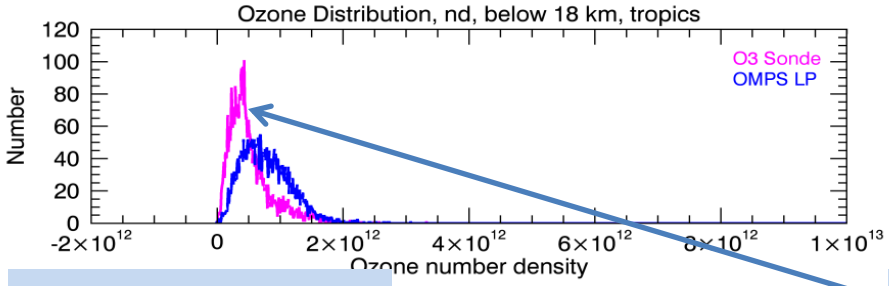
All latitudes



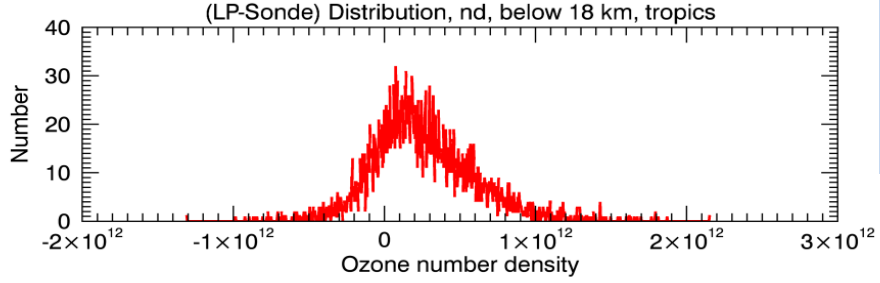
Extraropics (90-20S/N)





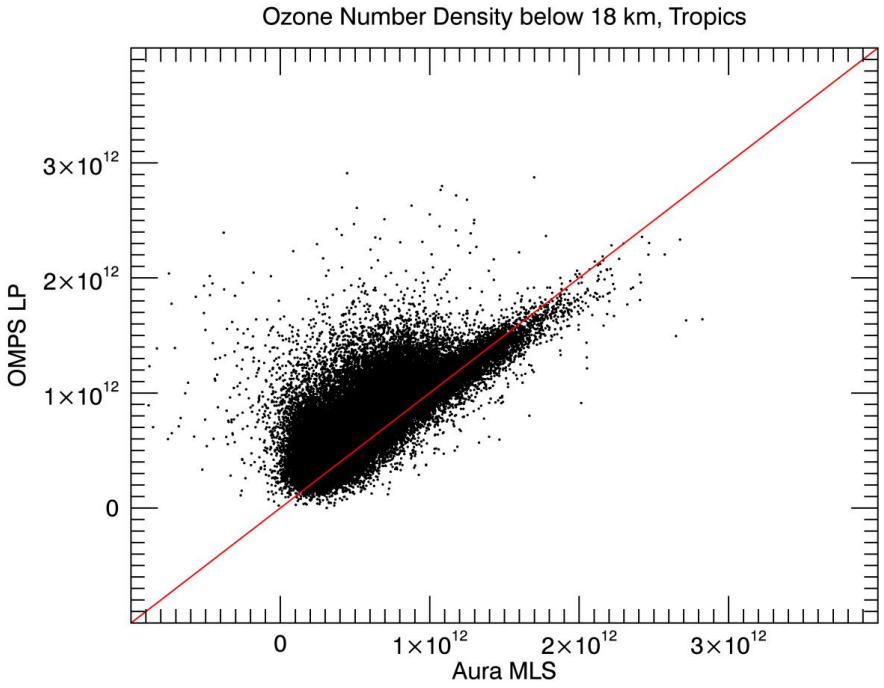


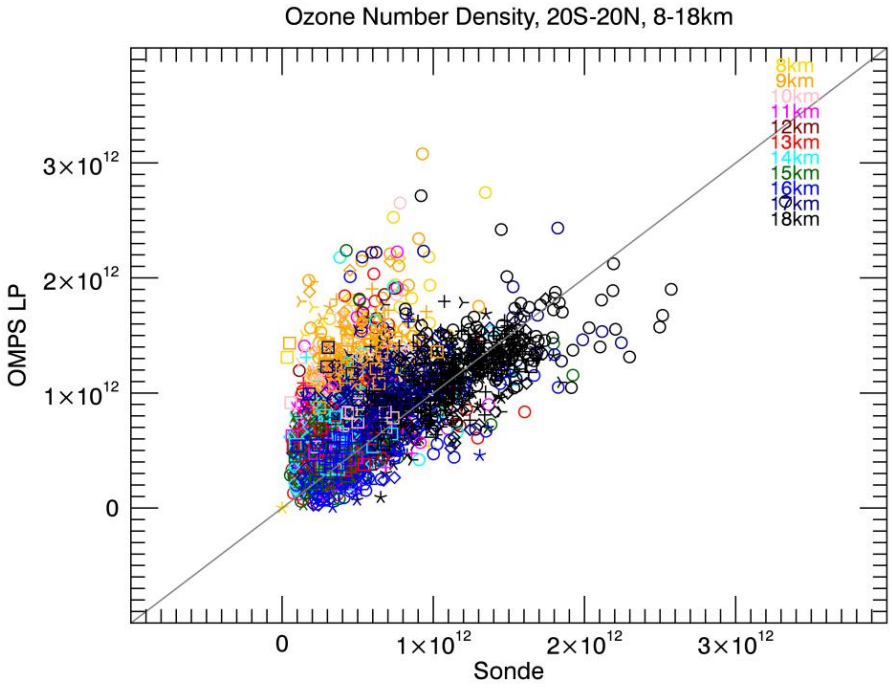
Tropics 20S-20N



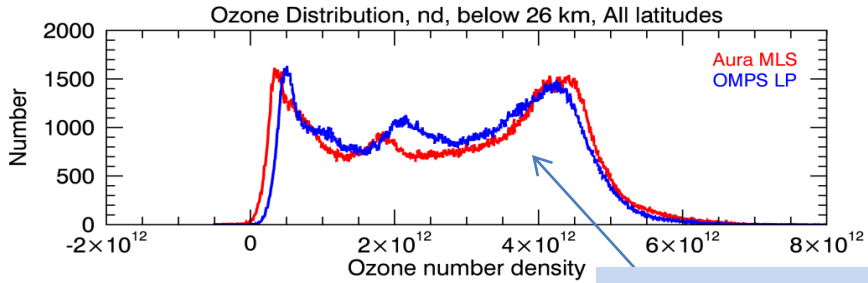
The ozone distribution from sondes is more narrow in the tropics compared to LP

Ozone distribution in the tropical UTLS (8-18 km)

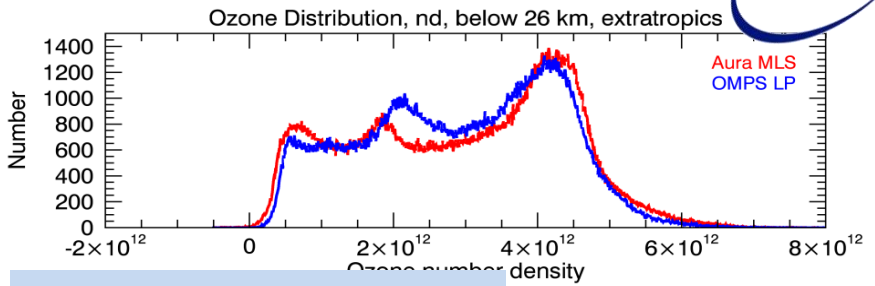




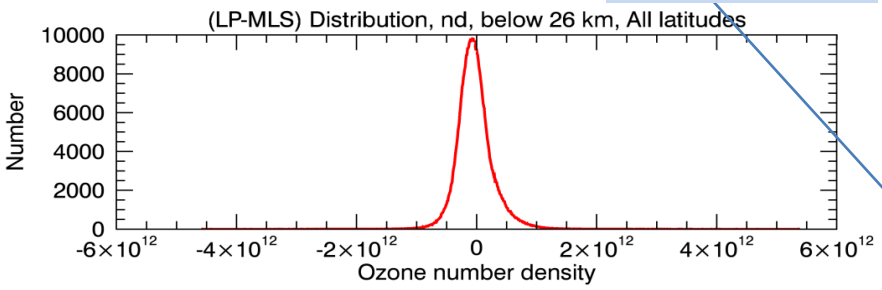
Ozone distribution (8-26 km), LP and MLS

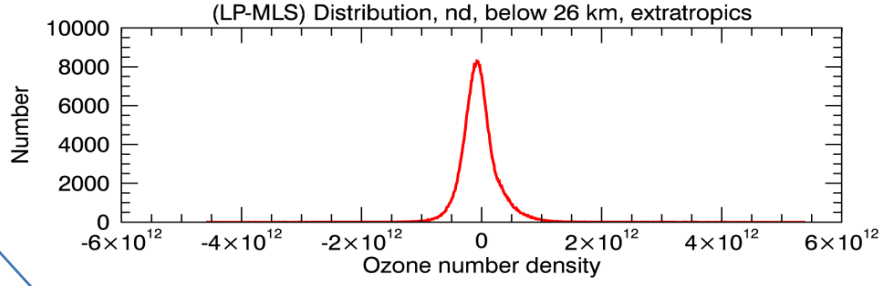


All latitudes

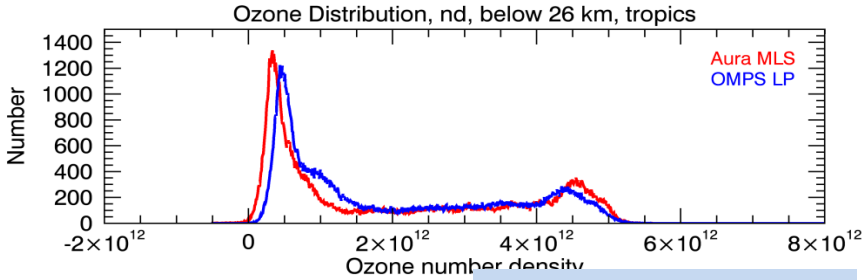


Extraropics (90-20S/N)

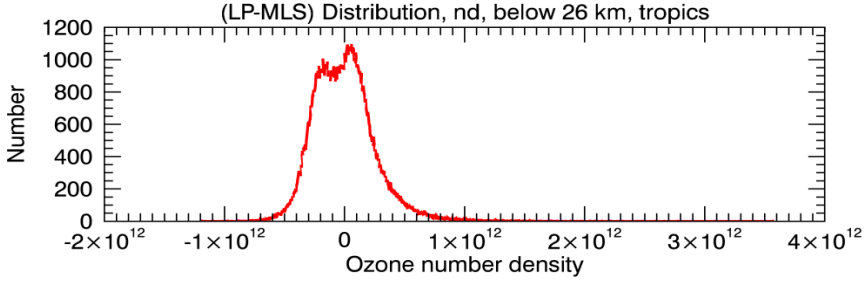




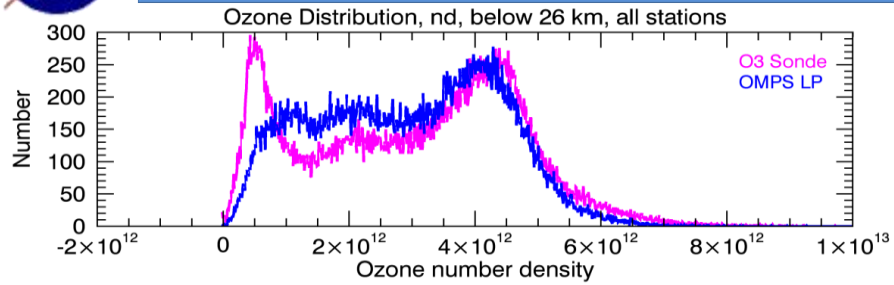
O3 PDFs below 26 km have three peaks



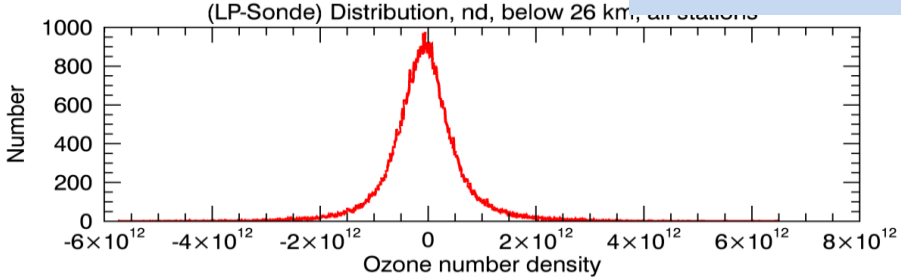
Tropics 20S-20N

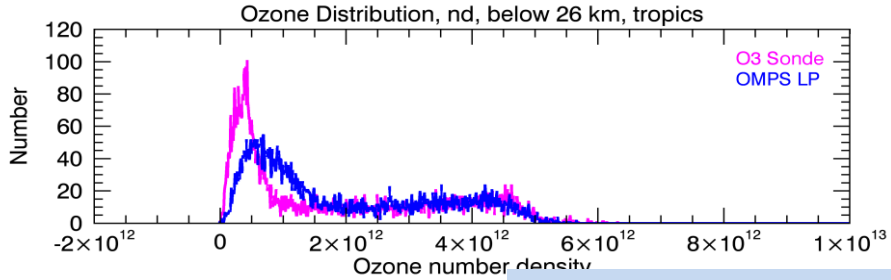


Ozone distribution (8-26 km)

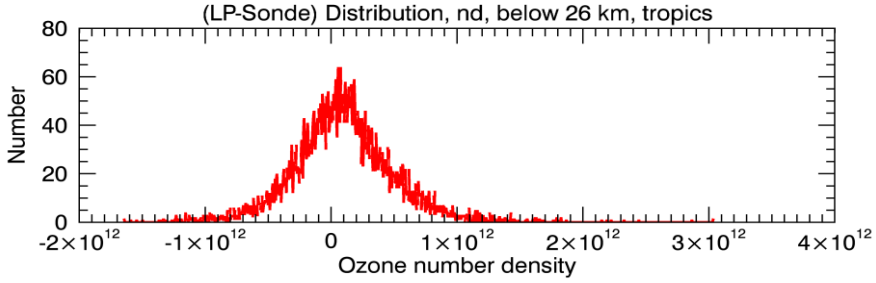


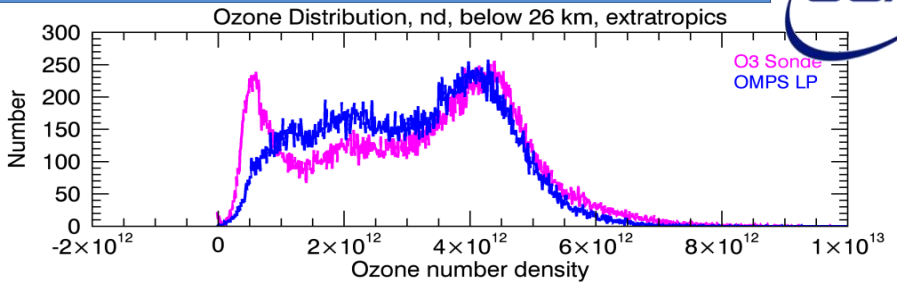
All latitudes



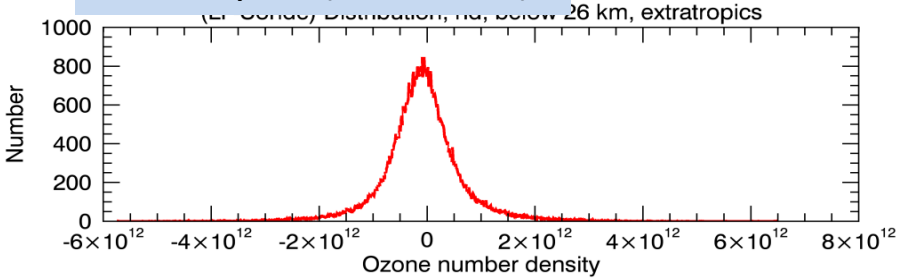


Tropics 20S-20N





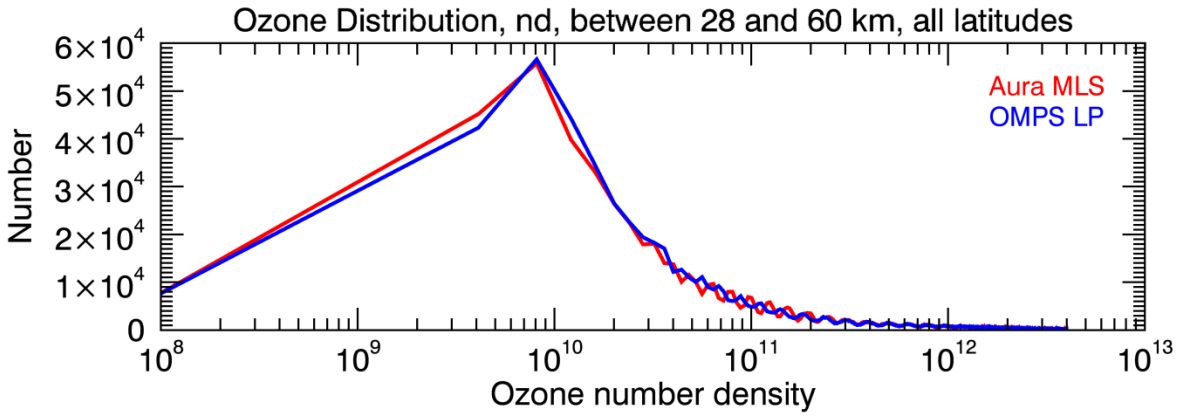
Extraropics (90-20S/N)

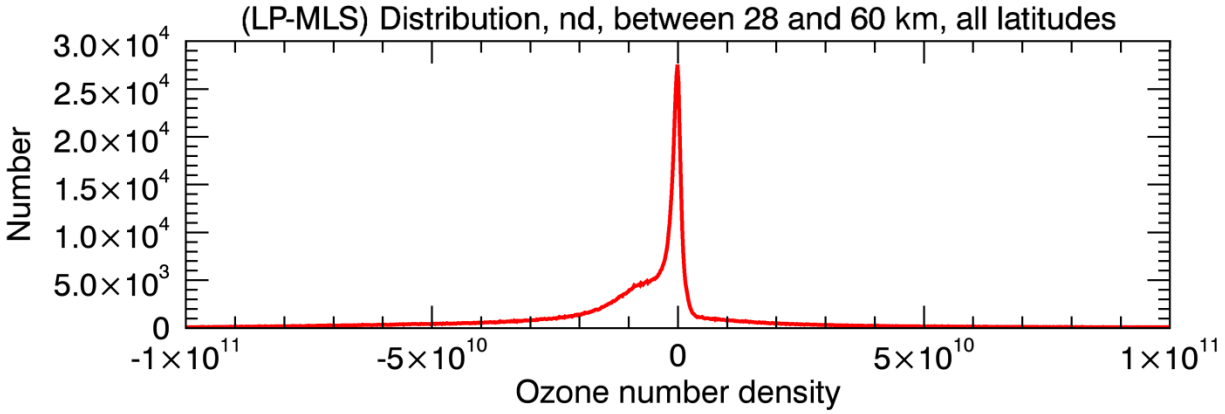


Comparisons with sondes also shows that LP distribution is more narrow

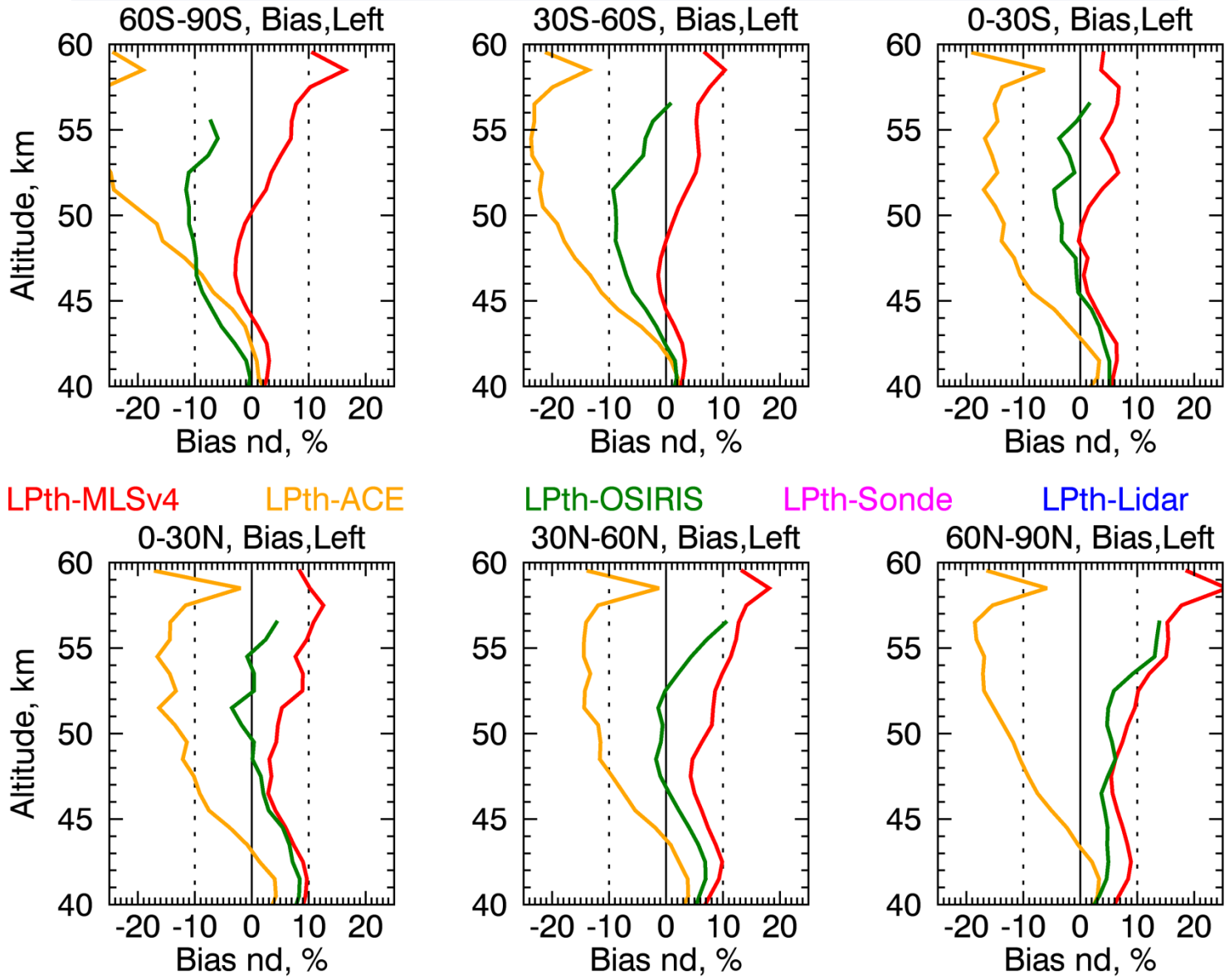
Backup slides

OMPS Limb Profiler

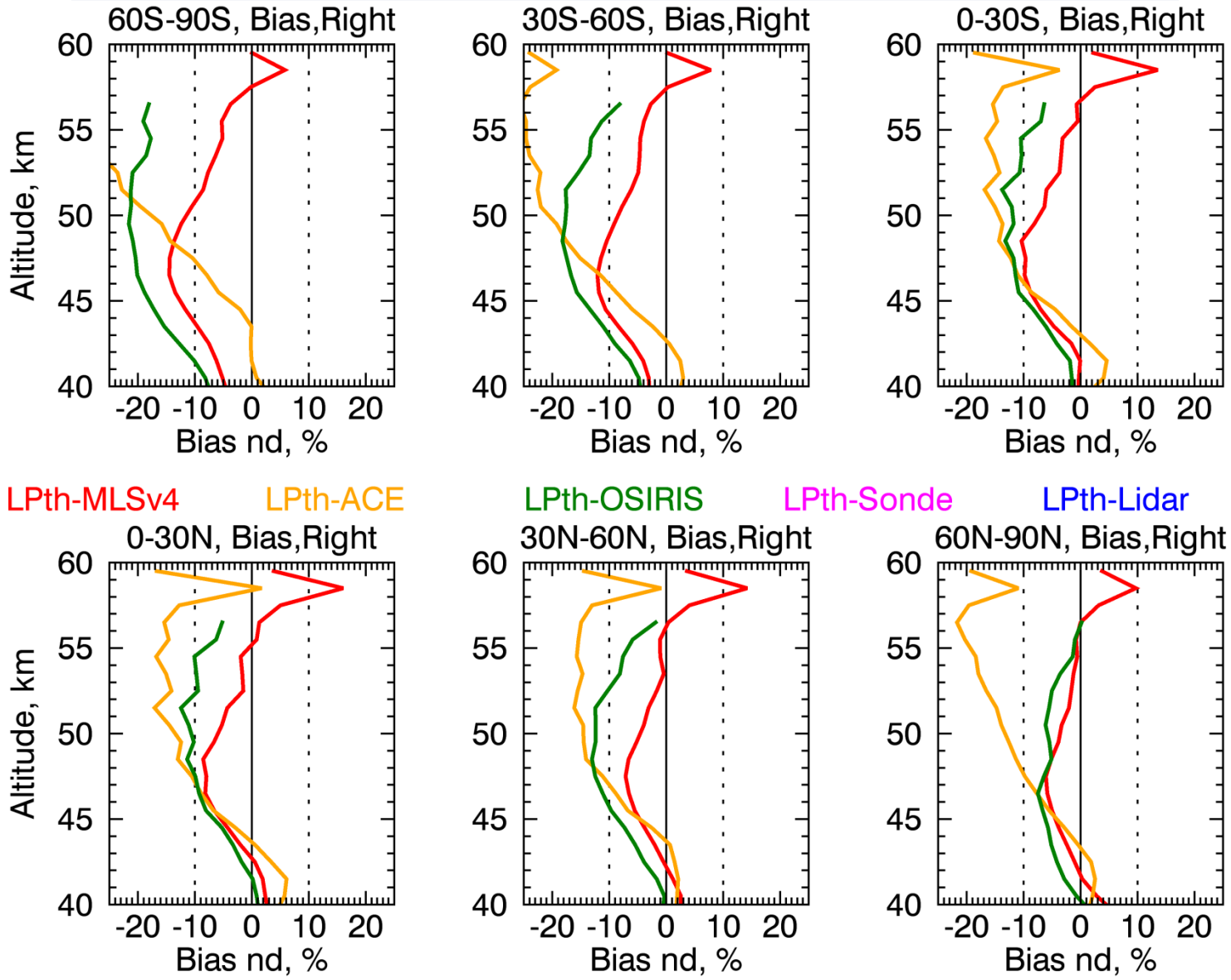




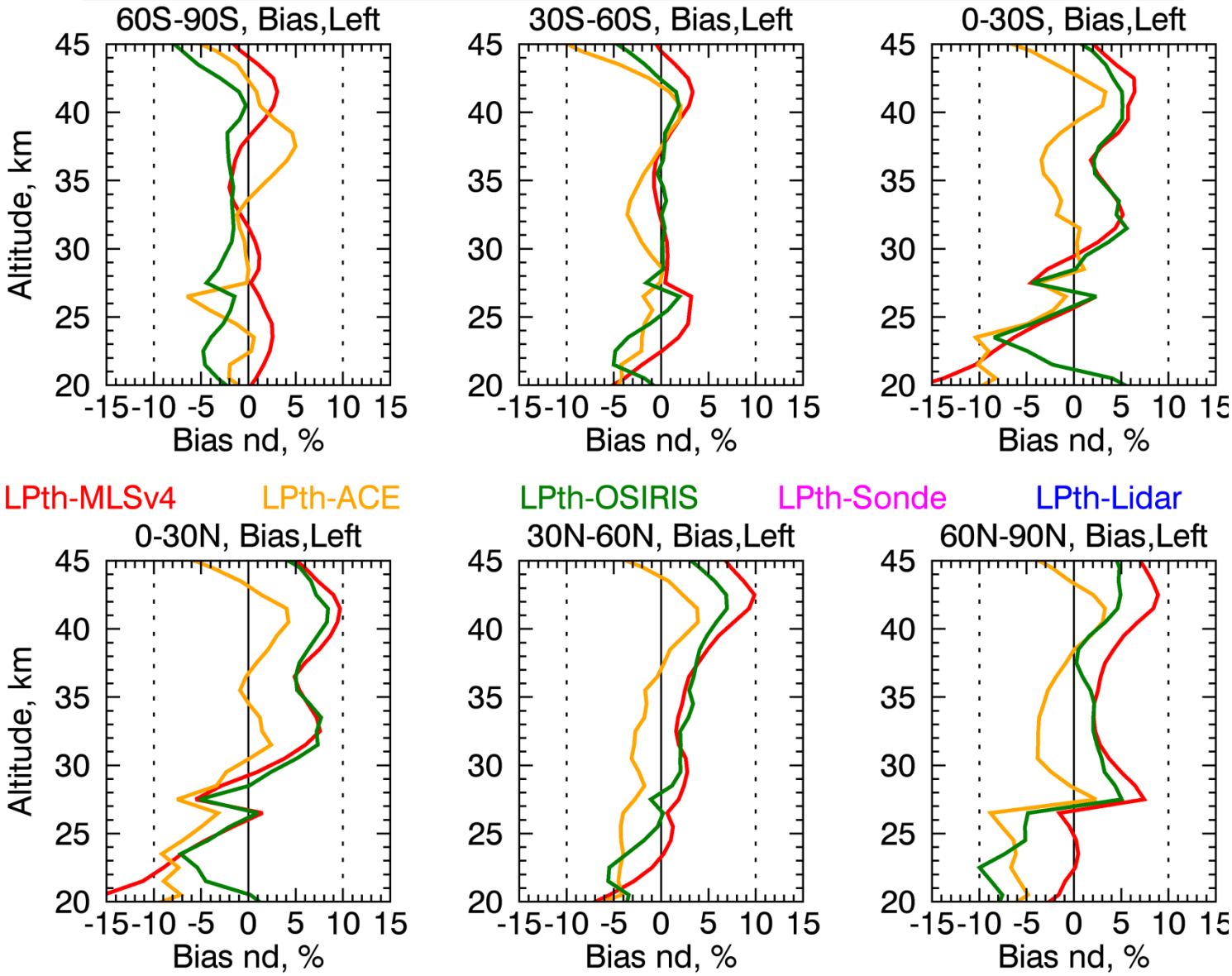
OMPS Limb Profiler



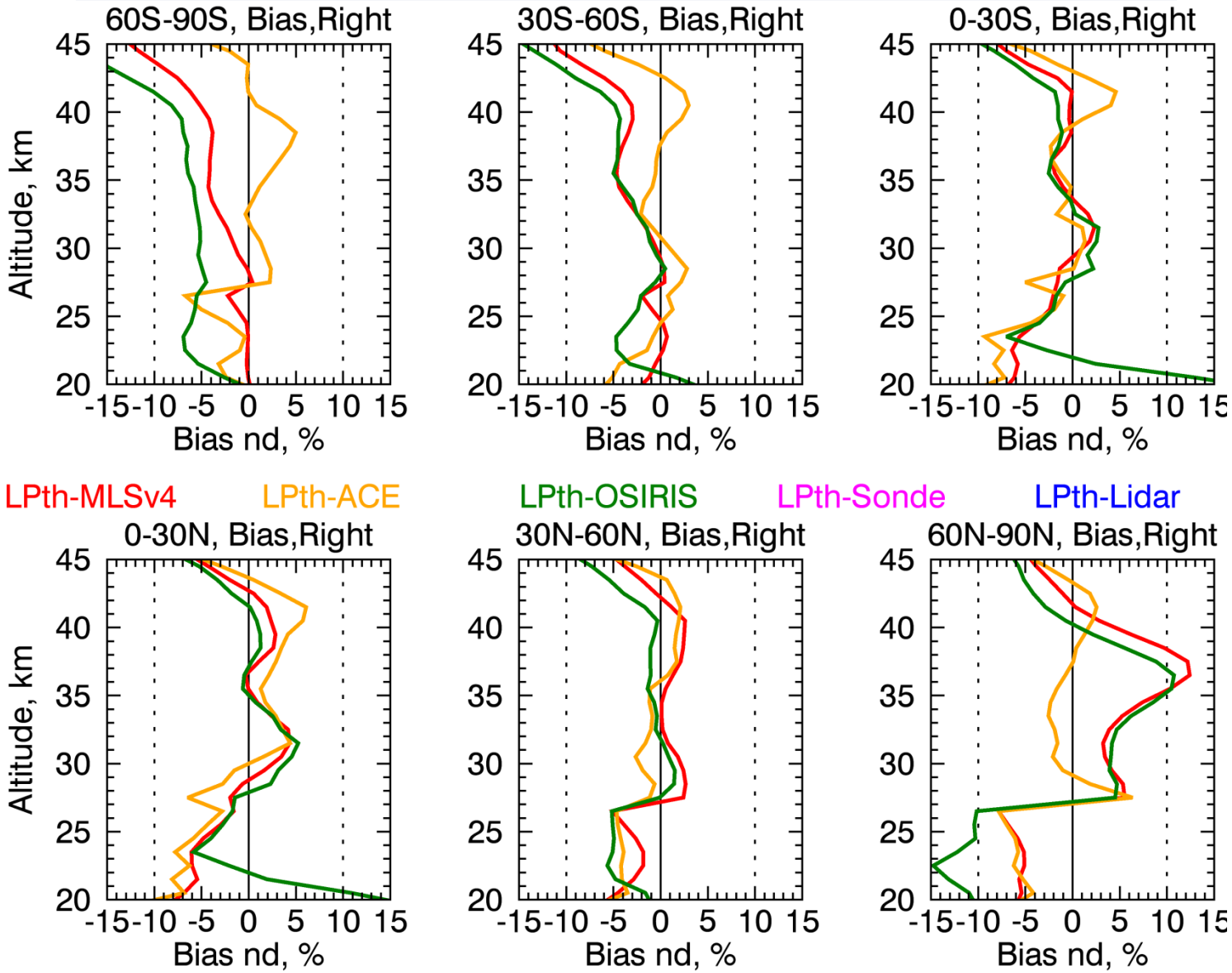
OMPS Limb Profiler



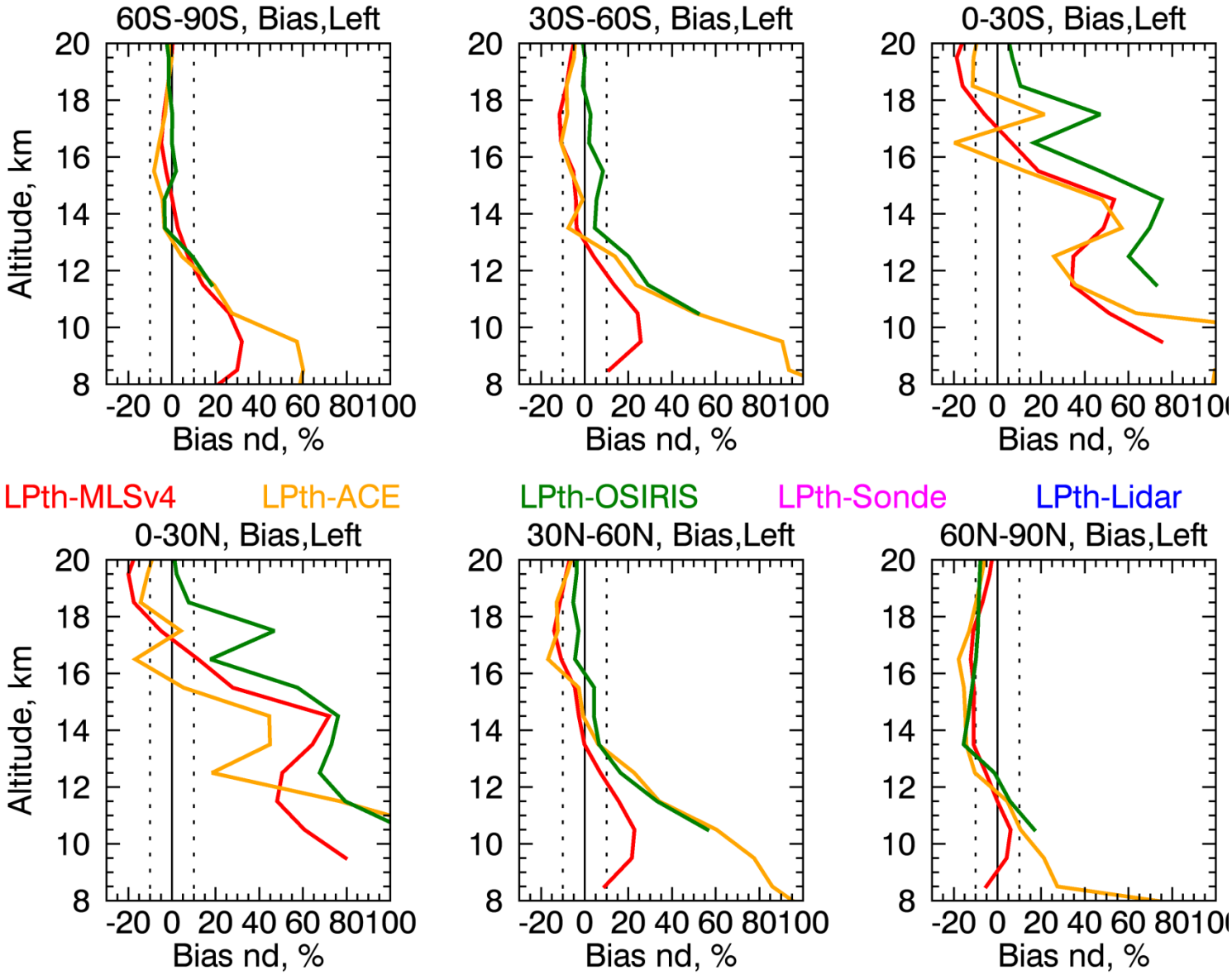
OMPS Limb Profiler



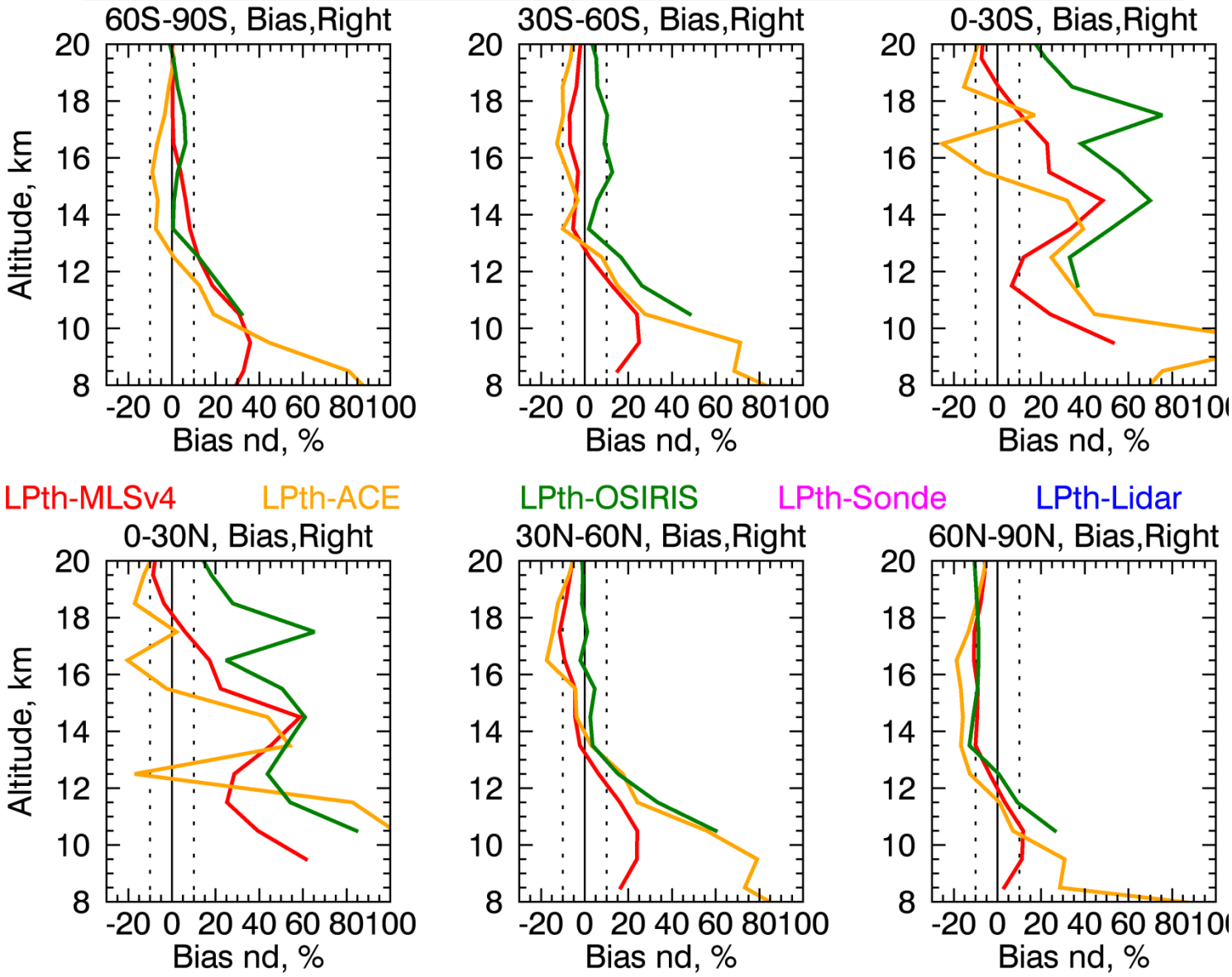
OMPS Limb Profiler



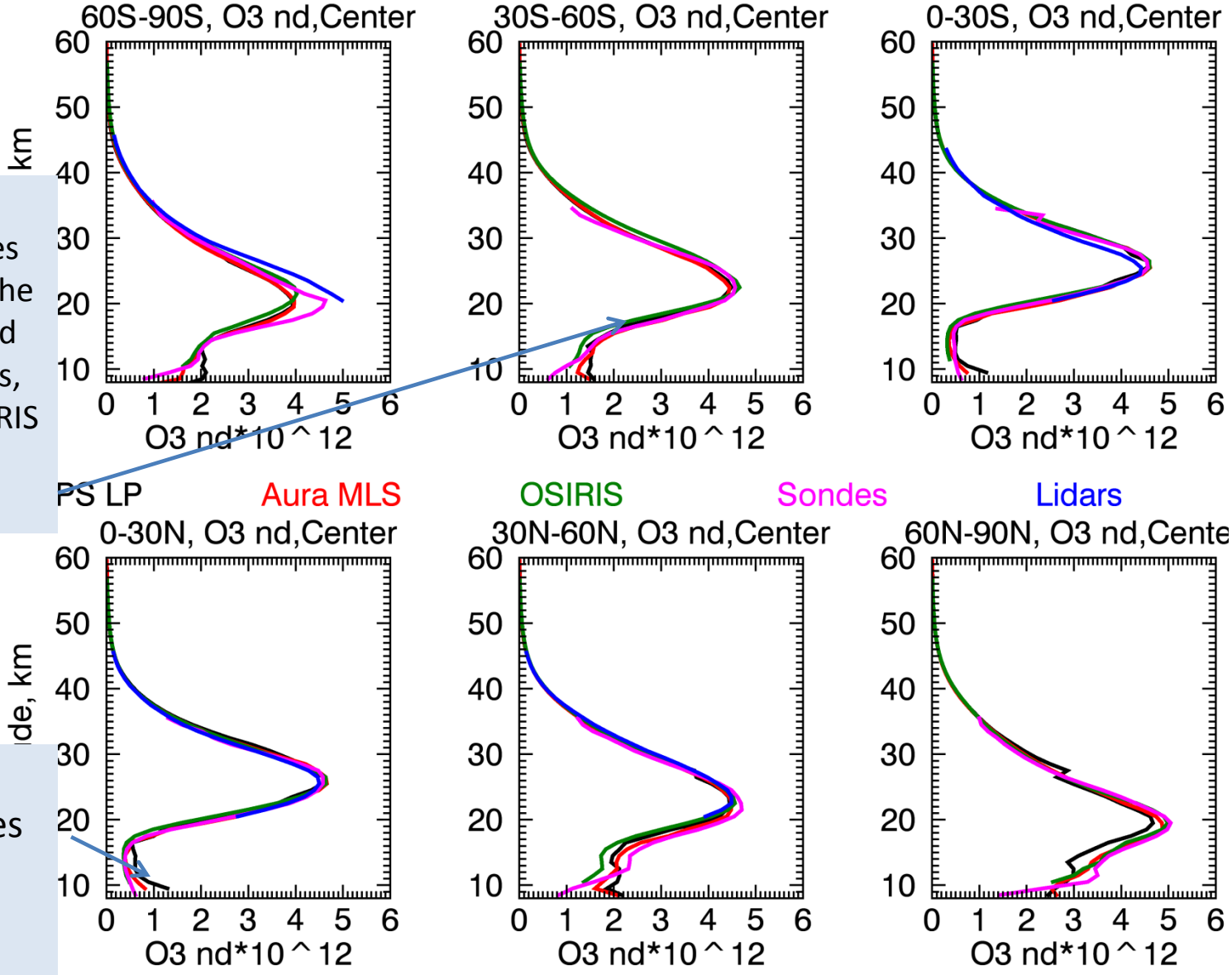
OMPS Limb Profiler



OMPS Limb Profiler



Ozone mean profiles



LP underestimates ozone below the peak compared to MLS, sondes, lidars, but OSIRIS show lower values

LP overestimates O3 in the lowermost stratosphere